

**NCAP-KAR-DR-20-02
NEW CAR ASSESSMENT PROGRAM (NCAP)
DYNAMIC ROLLOVER RESISTANCE TEST**

GENERAL MOTORS, LLC.

2021 CHEVROLET TAHOE RWD 5-DOOR SUV

**PREPARED BY:
APPLUS IDIADA KARCO ENGINEERING, LLC.
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ADELANTO, CA 92301**



DECEMBER 3, 2020

FINAL REPORT

**PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
NEW CAR ASSESSMENT PROGRAM
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1200 NEW JERSEY AVE, SE
WASHINGTON, D.C. 20590**

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TECHNICAL REPORT DOCUMENTATION PAGE

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16. Abstract An NCAP Dynamic Rollover Maneuver (Fishhook) Test was conducted on a 2021 Chevrolet Tahoe RWD 5-Door SUV by Applus+ IDIADA KARCO Engineering, LLC. on November 24, 2020. The vehicle did not experience two-wheel lift. The vehicle's steering angle at 0.3 g lateral acceleration at 50 mph was 34.9 degrees			
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SECTION I INTRODUCTION

The National Highway Traffic Safety Administration (NHTSA) has engaged Applus+ IDIADA KARCO Engineering, LLC to conduct dynamic rollover testing and gather data from that testing as part of NHTSA's New Car Assessment Program (NCAP).

The purpose of the testing reported herein was to determine if a 2021 Chevrolet Tahoe RWD 5-Door SUV would experience tip-up, defined as simultaneous two-wheel lift of two inches or more at an entry speed of 50 mph or less in the Dynamic Rollover Test Procedure developed by NHTSA. This procedure may be found at www.regulations.gov, docket item NHTSA-2006-26555-0136.

The testing reported herein was accomplished under contract 693JJ920D000011.

SECTION II

VEHICLE PREPARATION

A. TEST VEHICLE

The test vehicle was new or in as-new condition, meaning the vehicle had been driven no more than 500 miles prior to the start of dynamic rollover testing. It was acquired through a commercial rental/leasing company. Details of the test vehicle are given in Table 1.

B. TIRES

All tires used were new, and of the same make, model, size, and DOT specification of those installed on the vehicle when purchased new. Tire inflation pressures were in accordance with the recommendations indicated on each vehicle's identification placard. To further reduce the possibility of tire debanding, the tires were mounted to the rims without the use of tire mounting lubricant. Tire specifications are listed in Table 2.

C. VEHICLE LOADING

The multi-passenger load, described in the Fishhook Procedure, was used for all tests. The load and positioning of the load in the vehicle are listed in Table 3.

In addition to water dummies, the loading included instrumentation, a steering machine, and outriggers. Test vehicle bumper assemblies were removed for outrigger installation. The reduction in vehicle weight due to the removal of the bumpers was offset by the additional weight of the outriggers and their mounting system. The outrigger system typically outweighs the bumper assemblies.

Table 1. Test Vehicle Data

General Data					
Model year, make, model	2021 Chevrolet Tahoe				
VIN	1GNNSCKD2MR11xxxx				
Body style	SUV				
Number of doors	5				
Trim level	Premier				
Seating positions	Front:	2 nd row	3 rd row	4 th row	5 th row
	2	2	3		
Electronic stability control	Yes				
4-Wheel ABS (Yes/No)	Yes				
Power steering (Yes/No)	Yes				
Major optional equipment	-				
Odometer at start of testing	29 miles				
Drivetrain					
Engine cylinder arrangement	V8				
Engine displacement	5.3 L				
Transmission type	Automatic				
Drive arrangement	RWD				
Chassis					
Track width	F: 68.5 in (1740 mm), R: 68.2 in (1732 mm)				
Wheelbase	141.7 in (3600 mm)				
Curb weight	5445.4 lb (2470.0 kg)				
Certification Data from Vehicle's Label					
Vehicle manufactured by	General Motors, LLC.				
Date of manufacture	07/20				
GVWR	7400 lb (3357 kg)				
GAWR Front	3500 lb (1588 kg)				
GAWR Rear	4300 lb (1950 kg)				

Table 2. Tire Information

Tire Manufacturer	Bridgestone
Tire Model	Alenza
Tire Size	Front: 275/50R22 Rear: 275/50R22
Load rating	Front: 111 Rear: 111
Speed rating	Front: H Rear: H
Treadwear grade	Front: 700 Rear: 700
Traction grade	Front: A Rear: A
Temperature grade	Front: A Rear: A
Location of "Recommended Tire Pressure" label	Driver's door jamb
Recommended cold tire pressure	Front: 36 psi, (250 kPa) Rear: 36 psi, (250 kPa)
DOT code (8 first digits)	Front: 1W2 RHAA21 Rear: 1W2 RHAA21

Table 3. Vehicle Loading

Water dummy and other loading	Multi-Passenger Configuration 2 water dummies in second row, 1 dummy in third row
Water dummy weight	525.1 lb (238.2 kg)
Fuel level	Full
Weight as Tested	
Left front	1465 lb (664.5 kg)
Right front	1593 lb (722.5 kg)
Left rear	1961 lb (889.5 kg)
Right rear	1714 lb (777.5 kg)
Total weight	6733 lb (3054.0 kg)

D. STEERING CONTROLLER

Precise steering control is accomplished using a steering machine designed and constructed by ABD. It can provide up to 45 ft-lb torque and at rates over 1000 deg/sec. The integrated angle encoder has an unlimited range with a resolution of 0.25 degrees and an accuracy of ± 0.25 degrees. The steering motor is controlled by RC8 software from ABD, which also acts as the data acquisition system.

E. REAL-TIME CONTROLLER AND DATA ACQUISITION

Data acquisition is achieved using a MOSES Meas X, which also serves as the real-time system for the steering controller. Data from the OXTS, including Longitudinal, Lateral, and Vertical Acceleration, Roll, Yaw, and Pitch Rate, Forward and Lateral Velocity, Roll and Pitch Angle, are sent over Ethernet to the MOSES MeasX. The Oxford IMUs are calibrated per the manufacturer's recommended schedule (Table 5).

Two video cameras were used to record the Fishhook runs. They were positioned nominally as shown in Figure 1. The recorded video was reviewed after the Fishhook runs to check for any two-wheel lift. If any two-wheel lift was observed, four infrared distance measuring sensors for measurement of wheel lift (two sensors at each wheel) were then mounted for use in subsequent confirmation Fishhook tests.

F. EQUIPMENT WEIGHT

Table 4 lists the equipment and associated weights outlined in the NHTSA Laboratory Test Procedure for Dynamic Rollover and the equipment at Applus+ IDIADA KARCO Engineering, LLC used for this specific test program.

Table 4. Weight of In-Cab Test Equipment

Equipment	Location	Equipment Weight (lb)	
		NHTSA*	IDIADA
Data Acquisition System	Front passenger seat	58	35
GPS Inertial unit	At the chassis in a flat and rigid surface		7
Steering Machine	Handwheel	31	51
Steering Machine Electronics Box	Passenger row foot well behind the front passenger seat. If vehicle does not have a rear passenger row foot well, the Electronics Box should be placed in the front passenger seat footwell.	39	39
	Total	128	132

* Table A.1 from US DOT NHTSA - Laboratory Test Procedure for Dynamic Rollover - The Fishhook Maneuver Test Procedure - New Car Assessment Program (NCAP) - March 2013

G. SENSORS

A list of the sensors is given in Table 5.

H. OTHER VEHICLE PREPARATION

In addition to installation and preparation discussed above, the test vehicle was prepared as follows:

- Front and rear bumpers were removed.
- Outrigger mounts were installed in the bumper locations and titanium outriggers were fastened to these mounts.
- Airbags were removed or otherwise disabled.

Photographs of the vehicle tested are given in Appendix A.

Table 5. Sensor Specifications

Type	Measured Variable	Sensor	Range	Resolution	Accuracy	Specifics	Serial Number	Calibration	Unit					
<i>Multi-Axis Inertial Sensing System</i>	Longitudinal speed	GPS inertial unit	-	0.01 %/s 0.01 m/s ²	±0.1	OXTS (RT)	1611	By: IDIADA Date: 6/16/2020 Due: 6/16/2022	km/h					
<i>Distance Measuring System</i>	Lateral speed		-		±0.1				km/h					
	Longitudinal acc.		±100		±0.1				m/s ²					
<i>Radar Speed Sensor</i>	Lateral acc.		±100		±0.05				°					
	Roll angle		±100		±0.05				°					
<i>Data Flag (Roll Rate Flag)</i>	Pitch angle		±100		±0.1				°/s					
	Yaw angle		±100		±0.1				°/s					
	Roll rate		±100		±0.1				°/s					
	Pitch rate		±100		±0.1				°/s					
<i>Angle Encoder¹</i>	Steering angle		Steering wheel robot		>1000				0.25 deg	±0.20 ±0.25	ABD	769/17	By: IDIADA Date: 8/01/2019 Due: 8/01/2021	°
	Steering torque				60									Nm
<i>Infrared Distance Measuring System</i>	Tire wheel lift	Height sensors	300-700	0.01 mm	±0.8	OPTImess	OMS 4140-3098 OMS 4140-4506 OMS 4140-4508 OMS 4140-4509	By: IDIADA Date: 7/7/2020 Due: 7/7/2021	mm					
<i>Load Cell</i>	Brake Pedal Force	Load Cell	±600	-	±0.5	Novatech	48305	By: IDIADA Date: 3/27/2020 Due: 3/27/2021	N					
<i>Acquisition system</i>	-	Acquisition system	200	-	-	IDIADA Moses MEAS X	180749	By: IDIADA Date: 05/21/2020 Due: 05/21/2022	-					

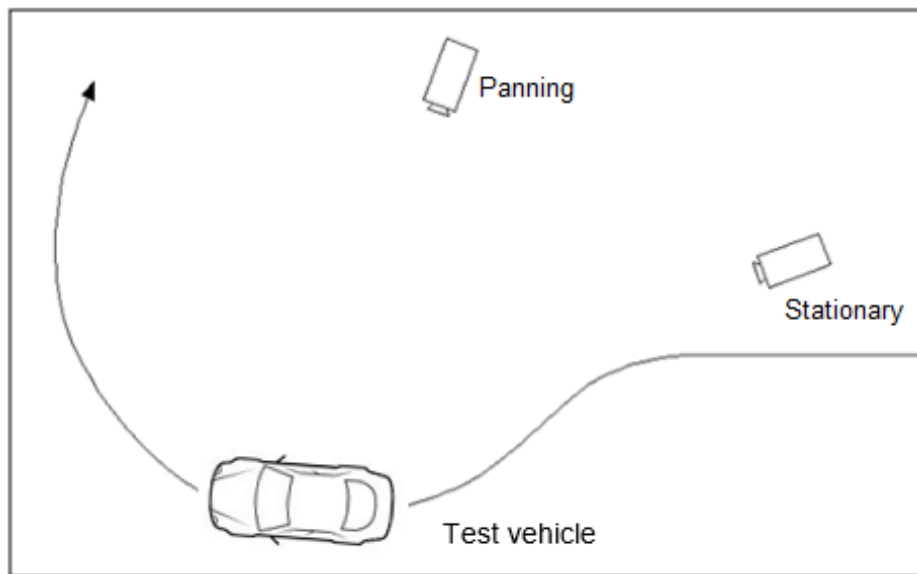


Figure 1. Nominal Position of Video Cameras for Fishhook Tests

SECTION III

TEST PROCEDURES

A. TEST PROCEDURE OVERVIEW

This test was conducted in accordance with NHTSA's NCAP Rollover Resistance Test Procedure (Fishhook) as described in the Federal Register (68 FR 59250). Detailed descriptions of the test procedure, pass/fail criteria, and data acquisition specifications may be found at docket NHTSA-2001-9663.

There are two major components of the test procedure, the Slowly Increasing Steer (SIS) pre-test and the Fishhook test.

The Slowly Increasing Steer (SIS) maneuver was used to characterize the steady state lateral dynamics of each vehicle, and is based on the "Constant Speed, Variable Steer" test defined in SAE J266. The maneuver is used to determine the handwheel angle that produces a lateral acceleration of 0.3 g at 50 mph. This handwheel angle is then used to determine the magnitude of steering to be used for the NHTSA Fishhook maneuver.

SIS tests were performed at a constant speed of 50 mph. Handwheel angle was input at a rate of 13.5 deg/sec, from 0 to an angle that provided at least 0.55 g. Three tests were conducted in each direction, and the data for the six runs were averaged to obtain the handwheel angle that produced 0.3 g at 50 mph.

The Fishhook test is a programmed steering maneuver that is implemented via the steering controller. The vehicle was initially steered in one direction and then the steering was reversed. The timing, magnitude and rate of the steering were prescribed by the Fishhook Procedure.

To begin the maneuver, the vehicle was driven in a straight line at a speed slightly greater than the desired entrance speed. The driver then released the throttle. When the vehicle was at the target speed, the steering controller automatically initiated the steering maneuver. Following completion of the steering reversal, the handwheel position was maintained for 3 seconds, and then returned to zero angle in 2 seconds.

The tests were conducted in both left-right and right-left directions. The “Default” test series used a handwheel angle equal to 6.5 times the handwheel angle that produced 0.3 g at 50 mph in the SIS tests, and initial vehicle speeds beginning at 35 mph and concluding up to 50 mph (if no two-wheel lift occurs). Supplemental tests were also done, as specified in the Fishhook Procedure.

A. TEST CONDITIONS

1. Test Surface

The tests were conducted on the Vehicle Dynamics Area (VDA) at HONDA Proving Center facility, located in Cantil, California, on 11/24/2020. The VDA has a smooth, flat (slope less than 0.5% throughout) asphaltic concrete surface. Its dimensions are as shown in Figure 2. The test was accomplished using an ASTM E1136 tire with an inflation pressure of 35 (± 0.5) psi at a test speed of 40 (± 0.5) mph. The net slip angle of the test tire for each test run was 7.5 deg. The surface friction measurement results are shown in Table 6.

Table 6. Lateral Surface Friction

Date of surface friction measurements	11/24/2020
Average lateral friction coefficient	0.94

2. Fishhook Handwheel Angles

The 0.3 g handwheel angle obtained from the SIS tests and the handwheel angles used in the Fishhook tests are shown in Table 7.

Table 7. Handwheel Angles

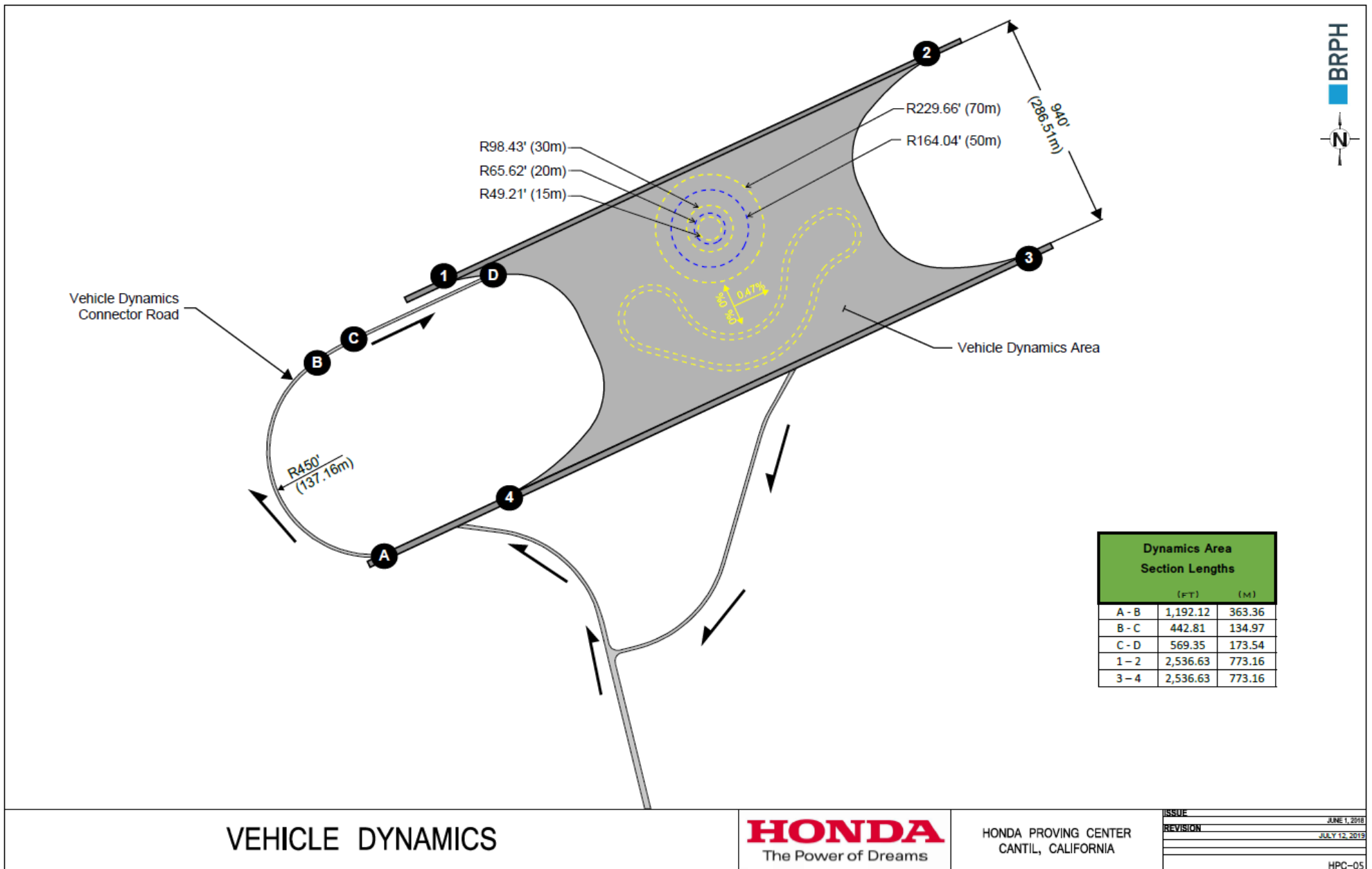
0.3 g handwheel angle (from SIS tests at 50 mph)	34.9°
5.5 scalar handwheel angle for Fishhook Test	192.0°
6.5 scalar handwheel angle for Fishhook Test	226.9°

3. Weather Conditions

The weather conditions, recorded at the end of testing, are shown in Table 8.

Table 8. Weather Conditions

Ambient temperature	60.0 °F (15.5 °C)
Wind Speed	14.6 mph (6.52 m/s)
Wind Direction	S



VEHICLE DYNAMICS



HONDA PROVING CENTER
CANTIL, CALIFORNIA

ISSUE	DATE
REVISION	JULY 12, 2019

HPC-05

Figure 2. Vehicle Dynamics Area at Honda Proving Center

SECTION IV

RESULTS

There is Appendix A with the photographic documentation. The test run log is given in Appendix B. A summary of the Slowly Increasing Steer Test is given in Appendix C. Appendix D contains time history plots for the 50 mph runs and any runs which resulted in two-wheel lift. For the 2021 Chevrolet Tahoe RWD 5-Door SUV, there was no two-wheel lift at any test condition.

**APPENDIX A
PHOTOGRAPHS**

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2021 TAHOE 2WD PREMIER

EXTERIOR: IRIDESCENT PEARL TRICOAT
 INTERIOR: JET BLACK

ENGINE, 5.3L ECOTEC3 V8
 TRANSMISSION, 10-SPEED AUTO

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- MECHANICAL LIMITED SLIP DIFFERENTIAL
- AUTOMATIC STOP/START ENGINE
- STABILITRAK

- ELECTRONIC PRECISION SHIFT
- TRAILERING EQUIPMENT

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- CHEVROLET INFOTAINMENT 3 PREMIUM WITH NAVIGATION
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- WIRELESS CHARGING FOR DEVICES
- KEYLESS OPEN, LOCK & START
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- SIRIUSXM RADIO CAPABLE, ALL ACCESS TRIAL W/ SUBSCRIPTION SOLD SEPARATELY

INTERIOR

- TRI-ZONE AUTOMATIC HVAC
- HEATED AND VENTILATED FRONT POWER BUCKET SEATS W/ LEATHER SEATING SURFACES
- MEMORY SETTINGS, DRIVER SEAT, OUTSIDE MIRRORS, STEERING COLUMN
- SECOND ROW HEATED BUCKET SEATS, POWER RELEASE
- THIRD ROW 60/40 SPLIT BENCH, POWER FOLD

EXTERIOR

- LED HEADLAMPS & TAILLAMPS
- LED DAYTIME RUNNING LAMPS
- HANDS FREE POWER LIFTGATE
- POWER FOLD MIRRORS
- DUAL EXHAUST W/ DUAL TIPS

SAFETY & SECURITY

- AUTOMATIC EMERGENCY BRAKING
- FORWARD COLLISION ALERT
- LANE KEEP ASSIST W/ LANE

DEPARTURE WARNING

- LANE CHANGE ALERT WITH SIDE BLIND ZONE ALERT
- HD REAR VISION CAMERA
- FRONT AND REAR PARK ASSIST
- REAR CROSS TRAFFIC ALERT
- FRONT PEDESTRIAN BRAKING
- FOLLOWING DISTANCE INDICATOR
- SAFETY ALERT SEAT
- THEFT DETERRENT SYSTEM

MANUFACTURER'S SUGGESTED RETAIL PRICE

STANDARD VEHICLE PRICE \$62,600.00

OPTIONS & PRICING

OPTIONS INSTALLED BY THE MANUFACTURER (MAY REPLACE STANDARD EQUIPMENT SHOWN)

22" POLISHED ALUMINUM WHEELS	1,975.00
IRIDESCENT PEARL TRICOAT	995.00
ALL-WEATHER FLOOR MATS (DEALER INSTALLED)	170.00

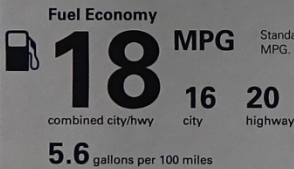
TOTAL OPTIONS	\$3,140.00
TOTAL VEHICLE & OPTIONS	\$65,740.00
DESTINATION CHARGE	1,295.00

TOTAL VEHICLE PRICE* \$67,035.00

EPA DOT Fuel Economy and Environment



Gasoline Vehicle



Standard SUVs range from 13 to 101 MPG. The best vehicle rates 141 MPGe.

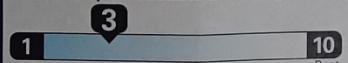
You spend \$3,750

more in fuel costs over 5 years compared to the average new vehicle.

G D M

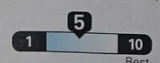
Annual fuel cost \$2,250

Fuel Economy & Greenhouse Gas Rating (tailpipe only)



This vehicle emits 492 grams CO₂ per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also creates emissions; learn more at fuelconomy.gov.

Smog Rating (tailpipe only)



Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 27 MPG and costs \$7,500 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$2.70 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

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Source: National Highway Traffic Safety Administration (NHTSA)
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WARNING
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 passenger-vehicle
 SEE OWNER'S MANUAL

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 MAJOR SOURCES OF FOREIGN PARTS CONTENT: MEXICO 38%

NOTE: PARTS CONTENT DOES NOT INCLUDE FINAL ASSEMBLY, DISTRIBUTION, OR OTHER NON-PARTS COSTS.

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 ARLINGTON, TX U.S.A.
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 TRANSMISSION: UNITED STATES

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ORDER NO XGNFTD SALES CODE E
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 DEALER NO 20388
 FINAL ASSEMBLY:
 ARLINGTON, TX U.S.A.
 VIN 1GN5CSKD2MR
 DEALER TO WHOM DELIVERED:
 PARADISE CHEVROLET
 6350 LELAND ST
 VENTURA, CA 93003-8585



MU
 1AZ0013247

Figure A1. Monroney Label



Figure A2. Right Front View, Test Vehicle As-Delivered



Figure A3. Left Rear View, Test Vehicle As-Delivered



Figure A4. Left Front View, Test Vehicle in Test Condition



Figure A5. Right Rear View, Test Vehicle in Test Condition



Figure A6. Vehicle's Certification Label



Figure A7. Vehicle's Tire Information Placard



Figure A8. Instrumentation in Test Vehicle



Figure A9. Steering Controller and Computer



Figure A10. Ballast Condition

**APPENDIX B
TEST RUN LOG**

Run Number	Test Type	Speed (mph)	Handwheel Angle (deg)	Dir. of First Steer	2 Wheel Lift	Notes
1	Tire Warm-Up	35	30.0	Left	N/A	Resulted in ay = 0.21g
2	"	"	59.0	"	"	Resulted in ay = 0.37g
3	"	"	"	"	"	
4	"	"	"	"	"	
5	2x SWA last cycle	"	118.0	"	"	2x SWA last cycle
6	Static	0	0	N/A	N/A	
7	Steady State	21.5	0	N/A	"	
8	Slowly Increasing Steer	50	30.0	Left	N/A	
9	"	"	49.5	Left	"	HW angle at 0.3 g = -35.1
10	"	"	"	Left	"	HW angle at 0.3 g = -35.1
11	"	"	"	Left	"	HW angle at 0.3 g = -35.7
12	"	"	"	Right	"	HW angle at 0.3 g = 34.5
13	"	"	"	Right	"	HW angle at 0.3 g = 34.5
14	"	"	"	Right	"	HW angle at 0.3 g = 34.3
						Average = 34.9
15	Fishhook 6.5 Scalar	35	226.9	Left	No	
16	"	40	"	"	"	
17	"	45	"	"	"	
18	"	47.5	"	"	"	
19	"	50	"	"	"	
20	Fishhook 5.5 Scalar	45	192.0	Left	No	
21	"	47.5	"	"	"	
22	"	50	"	"	"	

Run Number	Test Type	Speed (mph)	Handwheel Angle (deg)	Dir. of First Steer	2 Wheel Lift	Notes
23	Fishhook 6.5 Scalar	35	226.9	Right	No	
24	"	40	"	"	"	
25	"	45	"	"	"	
26	"	47.5	"	"	"	
27	"	50	"	"	"	
28	Fishhook 5.5 Scalar	45	192.0	Right	No	
29	"	47.5	"	"	"	
30	"	50	"	"	"	

APPENDIX C
SLOWLY INCREASING STEER TEST WORKSHEET

2021 Chevrolet Tahoe 5-Door SUV, Multi-Passenger Configuration,
 Test Date: 11/24/2020



Slowly Increasing Steer



Vehicle: 2021 Chevrolet Tahoe
 Test Date: 11/24/2020
 Analysis Date: 11/24/2020
 Analysed by: EL
 Executed by: OG
 Configuration: ESC on

Weight Condition: Test condition
 Test Track: Dynamic Platform
 Comments: SIS
 Test Speed: 50 MPH

Run	Dir of Steer	Start speed [mph]	End speed [mph]	Speed red [%]	Index of ay	HW angle [deg] at 0.3g	ay [g] 0.3g index	6.5x HW angle [deg]	Ramp time [sec] at 6.5x	5.5x HW angle [deg]	Ramp time [sec] at 5.5x	R2	Zero Begin index	Zero End index
HPC2_SIS_001	L	49.8	0.6	98.8	1131	-35.1	-0.300	-228.1	-0.3168	-193.0	-0.2680	0.9971	396	596
HPC2_SIS_002	L	49.6	0.1	99.8	1129	-35.1	-0.300	-228.2	-0.3170	-193.1	-0.2682	0.9967	394	594
HPC2_SIS_003	L	49.1	0.1	99.8	1141	-35.7	-0.300	-231.9	-0.3220	-196.2	-0.2725	0.9965	375	575
HPC2_SIS_004	R	49.2	0.4	99.2	1122	34.5	0.300	224.1	0.3112	189.6	0.2633	0.9924	395	595
HPC2_SIS_005	R	49.0	0.2	99.7	1114	34.5	0.300	224.4	0.3117	189.9	0.2637	0.9944	399	599
HPC2_SIS_006	R	49.2	0.5	99.0	1118	34.3	0.300	222.9	0.3096	188.6	0.2619	0.9963	412	612

Mean: 34.9

Steering Controller Input values

Scalar 6.5 values:

Initial HW angle: 226.9 deg

Reversal HW angle: -226.9 deg

Scalar 5.5 values:

Initial HW angle: 192.0 deg

Reversal HW angle: -192.0 deg

APPENDIX D
TIME HISTORY PLOTS

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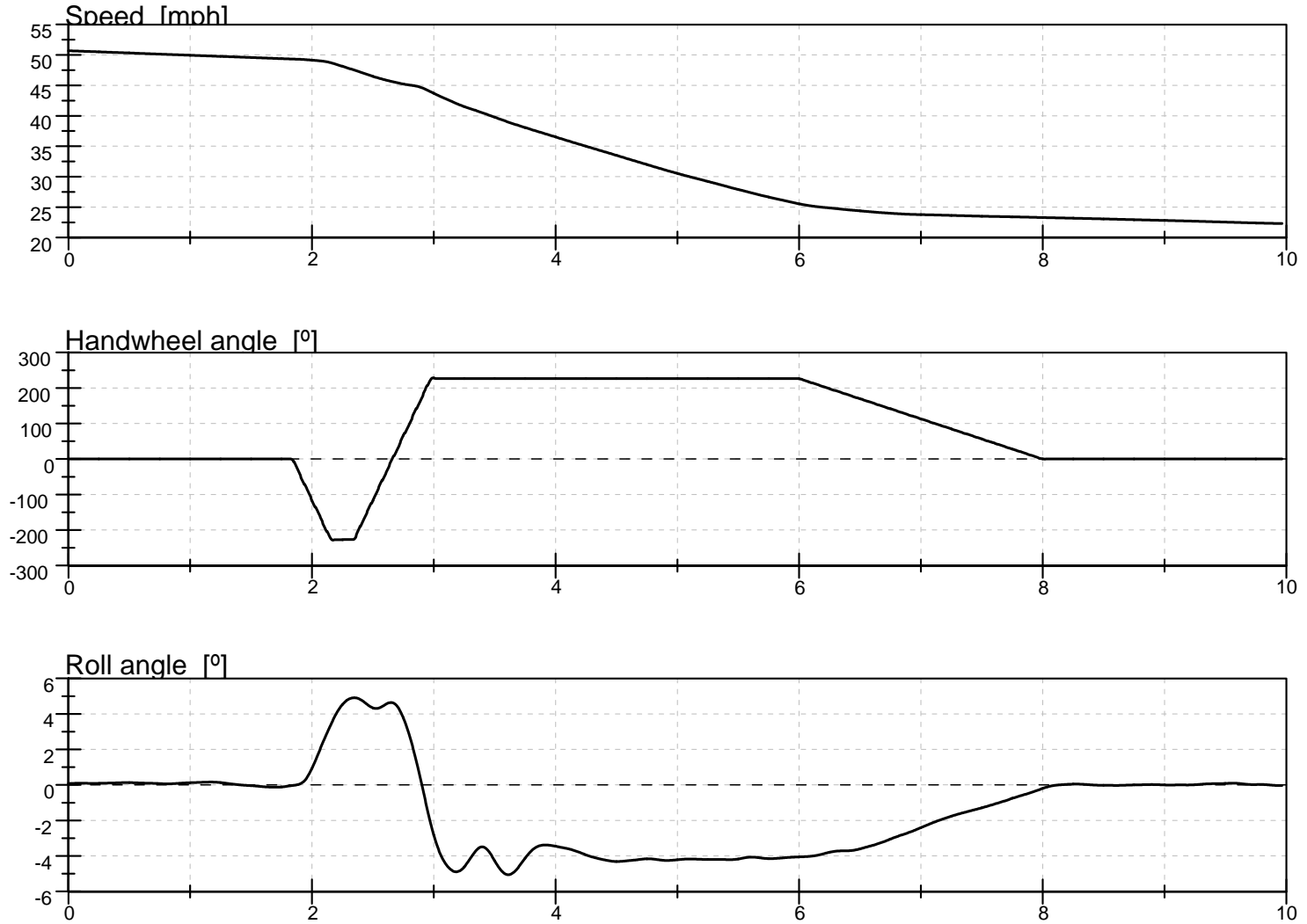


Figure D1. Vehicle Speed, Handwheel Angle, and Roll Angle Time History Plots for Default Test Series, L-R, 50 mph

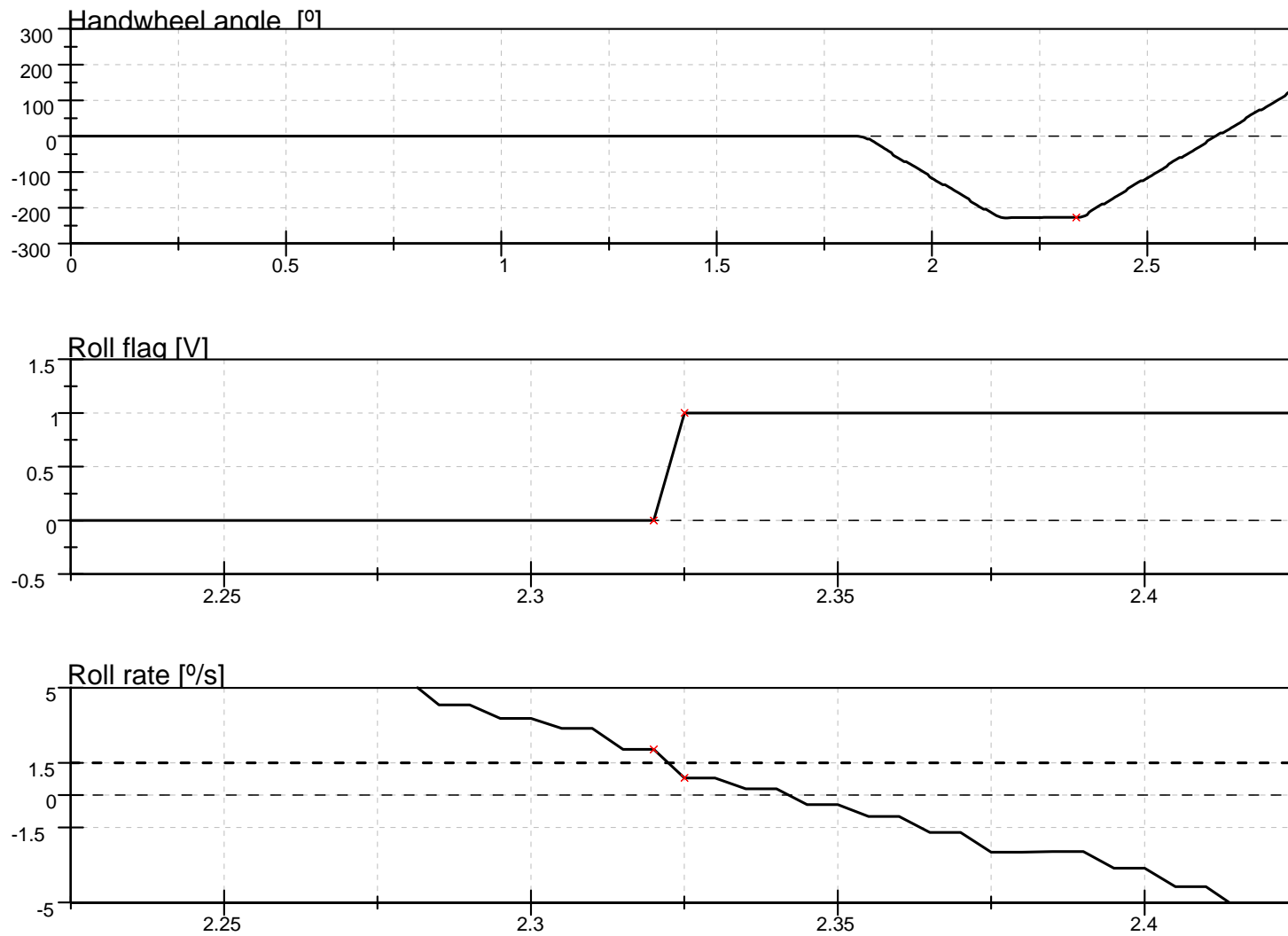


Figure D2. Steering Machine Operation Time History Plots for Default Test Series, L-R, 50 mph

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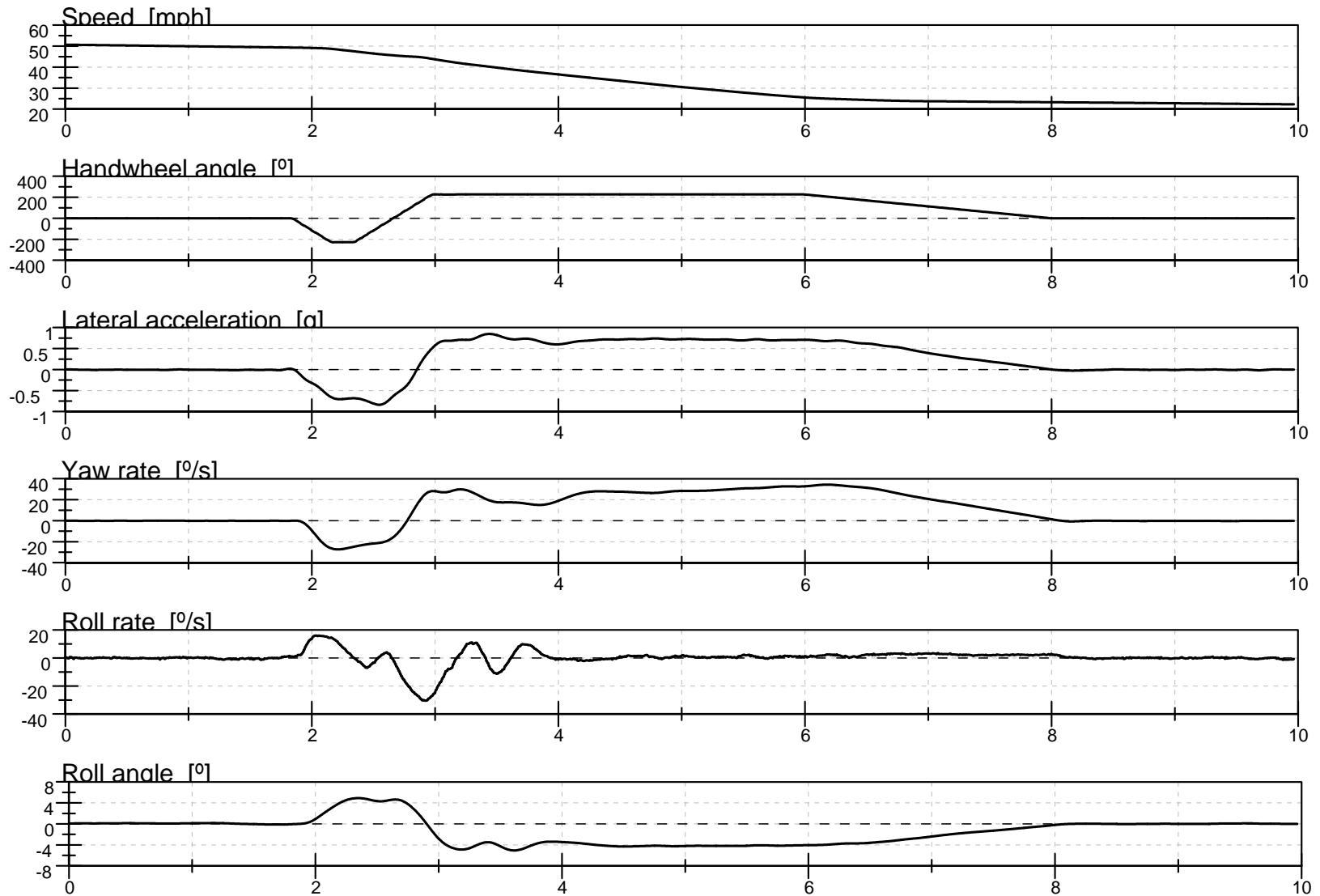


Figure D3. Yaw Rate, Roll Rate, and Lateral Acceleration Time History Plots For Default Test Series, L-R, 50 mph

FILENAME: FH005

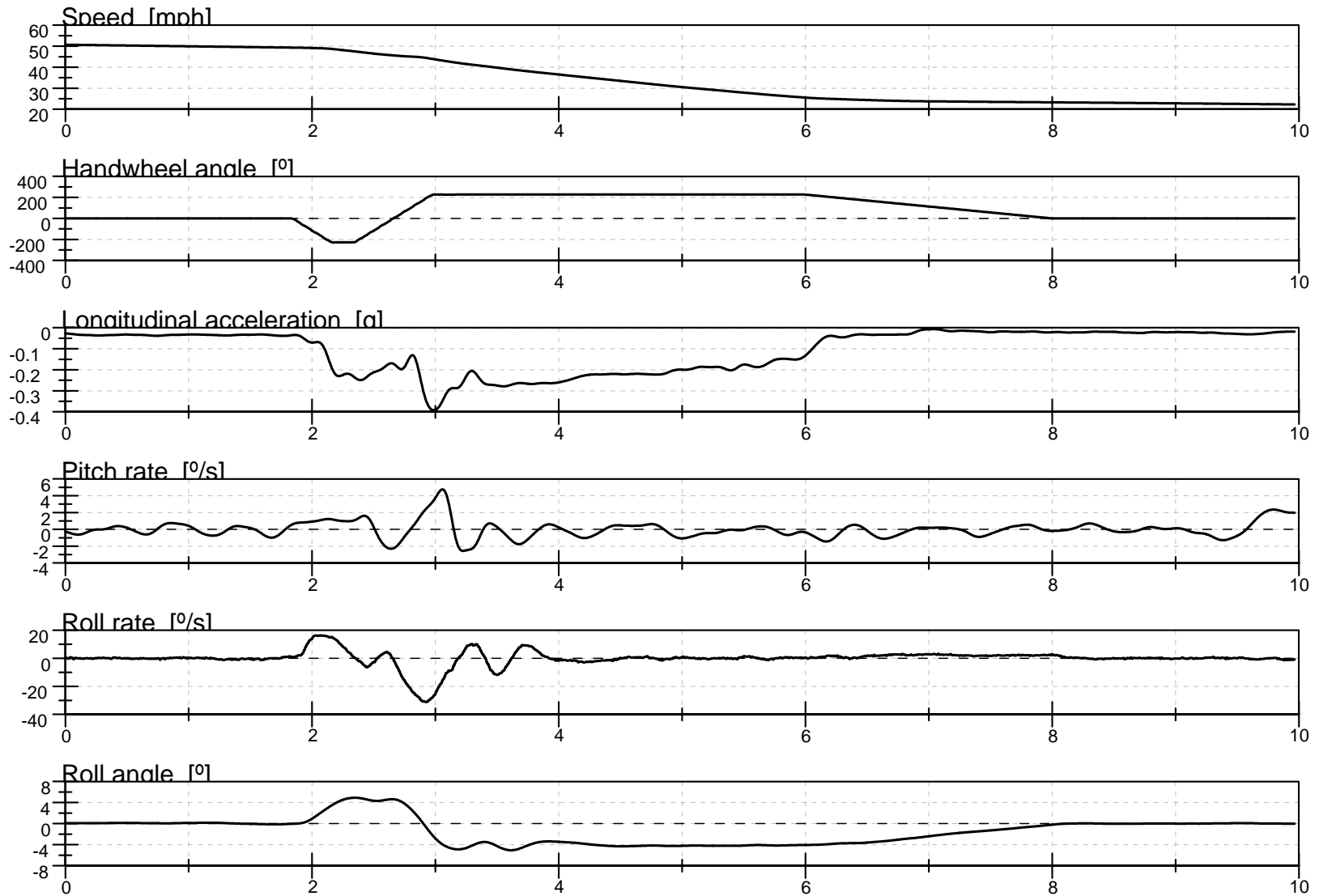


Figure D4. Pitch Rate and Longitudinal Acceleration Time History Plots for Default Test Series, L-R, 50 mph

FILENAME: FH010

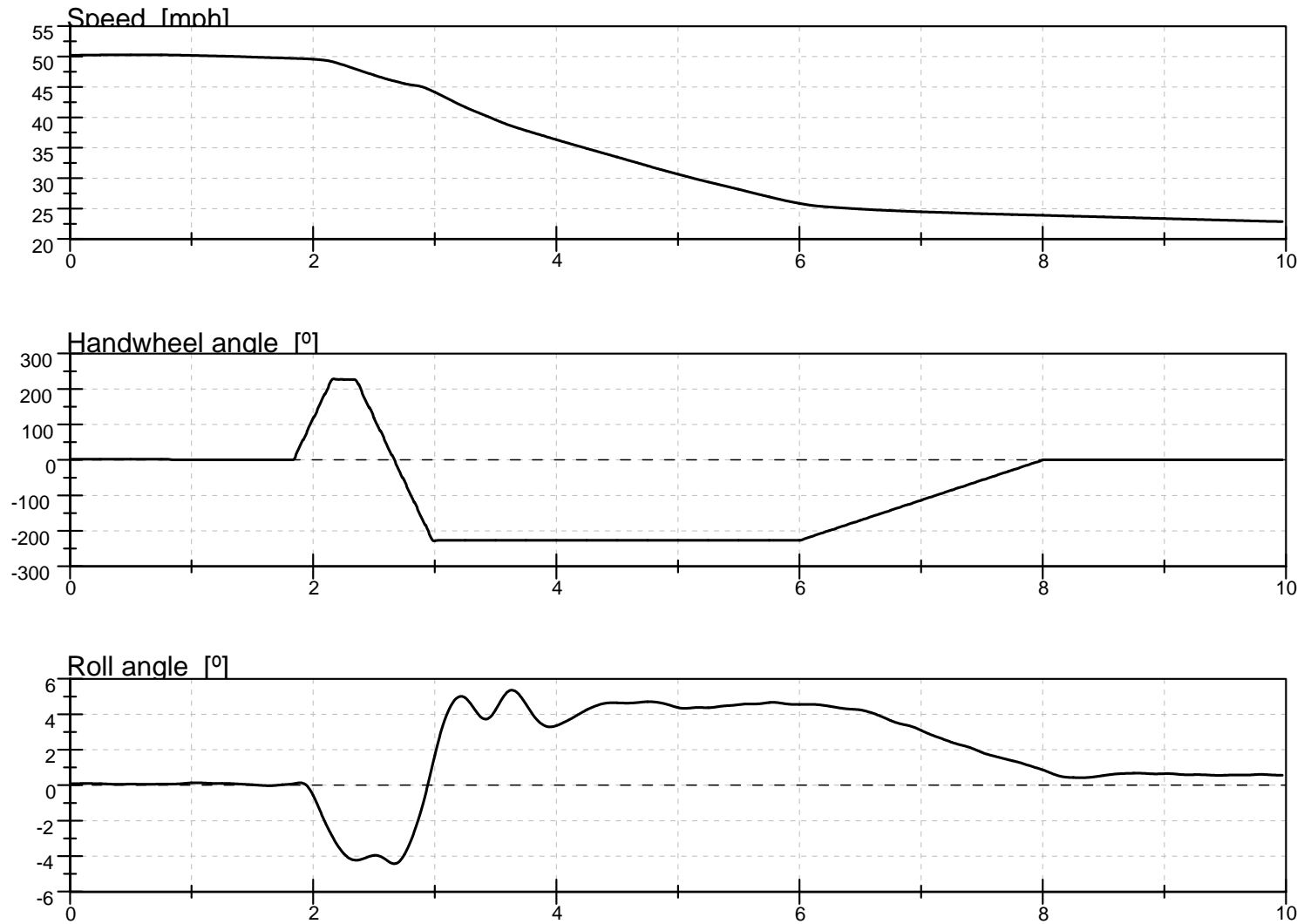


Figure D5. Vehicle Speed, Handwheel Angle, and Roll Angle Time History Plots for Default Test Series, R-L, 50 mph

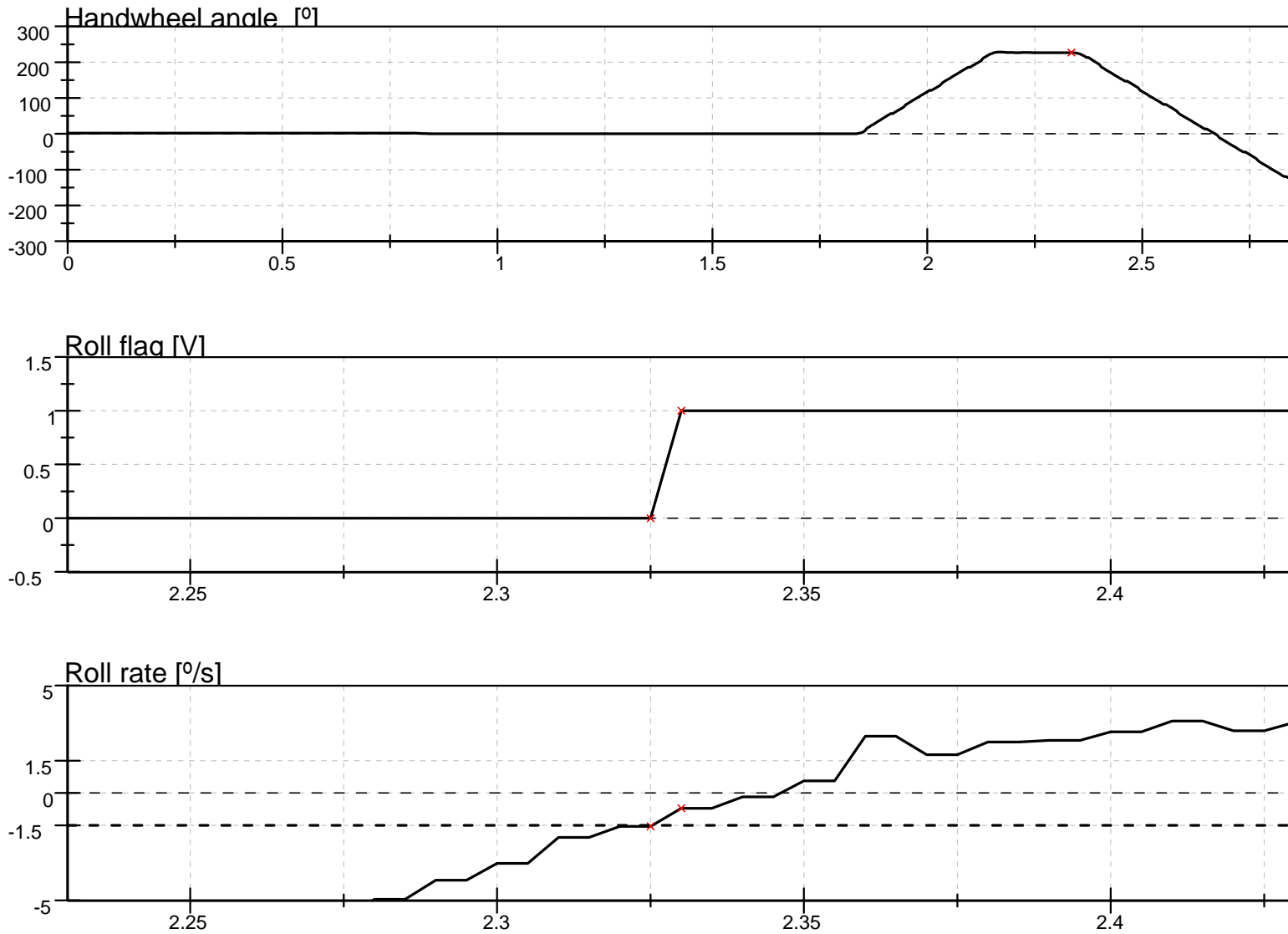


Figure D6. Steering Machine Operation Time History Plots for Default Test Series, R-L, 50 mph

FILENAME: FH010

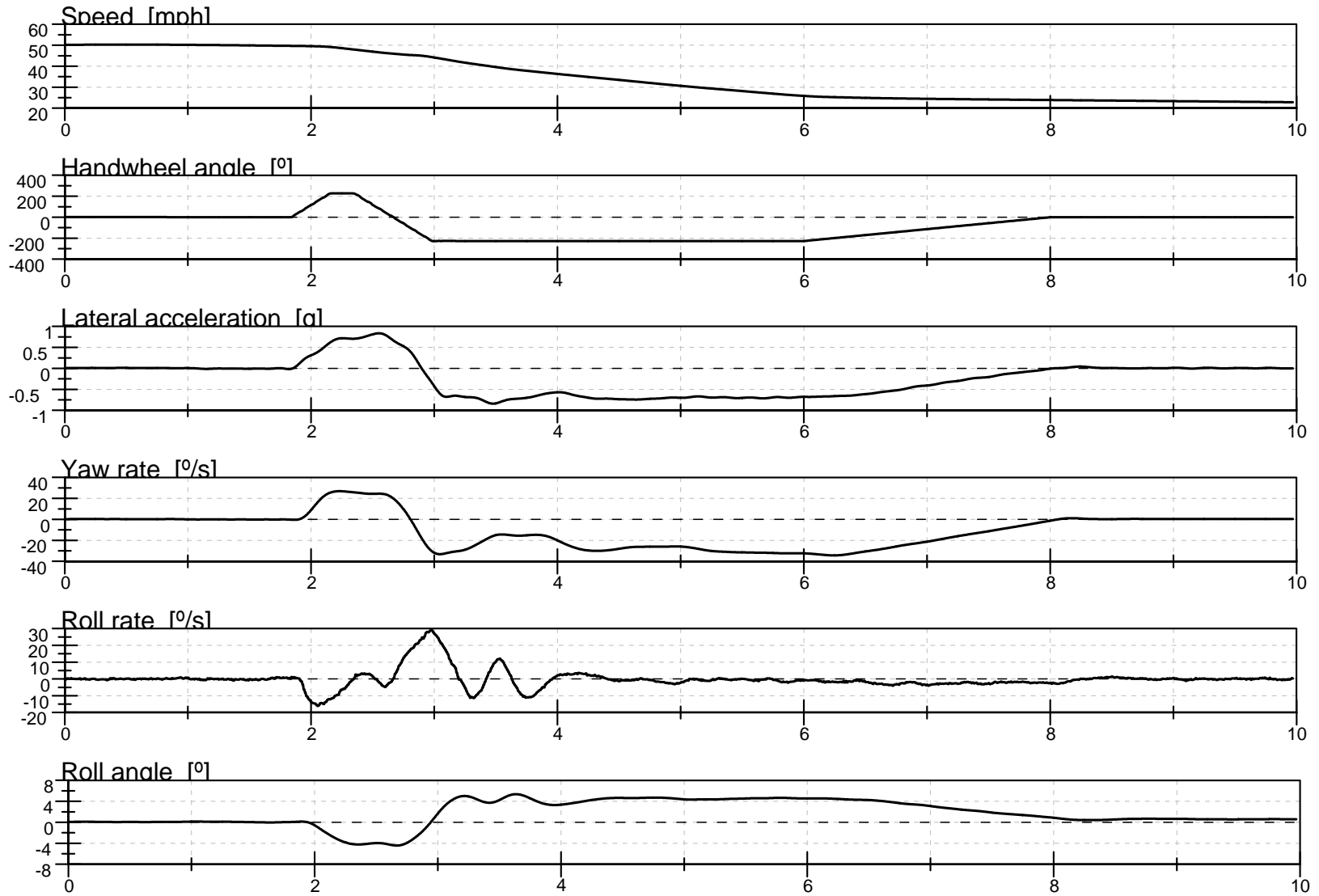


Figure D7. Yaw Rate, Roll Rate, and Lateral Acceleration Time History Plots for Default Test Series, R-L, 50 mph

FILENAME: FH010

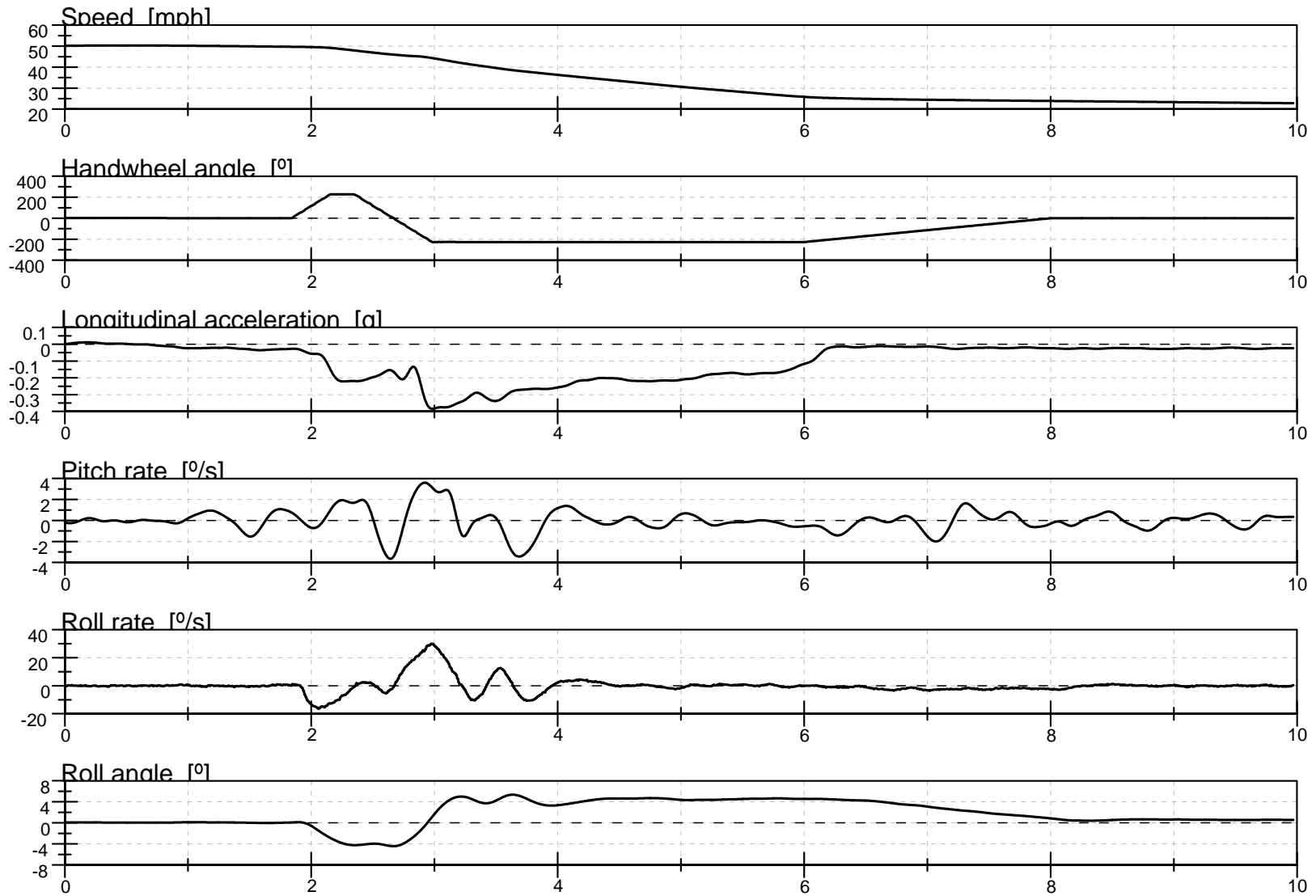


Figure D8. Pitch Rate and Longitudinal Acceleration Time History Plots or Default Test Series, R-L, 50 mph

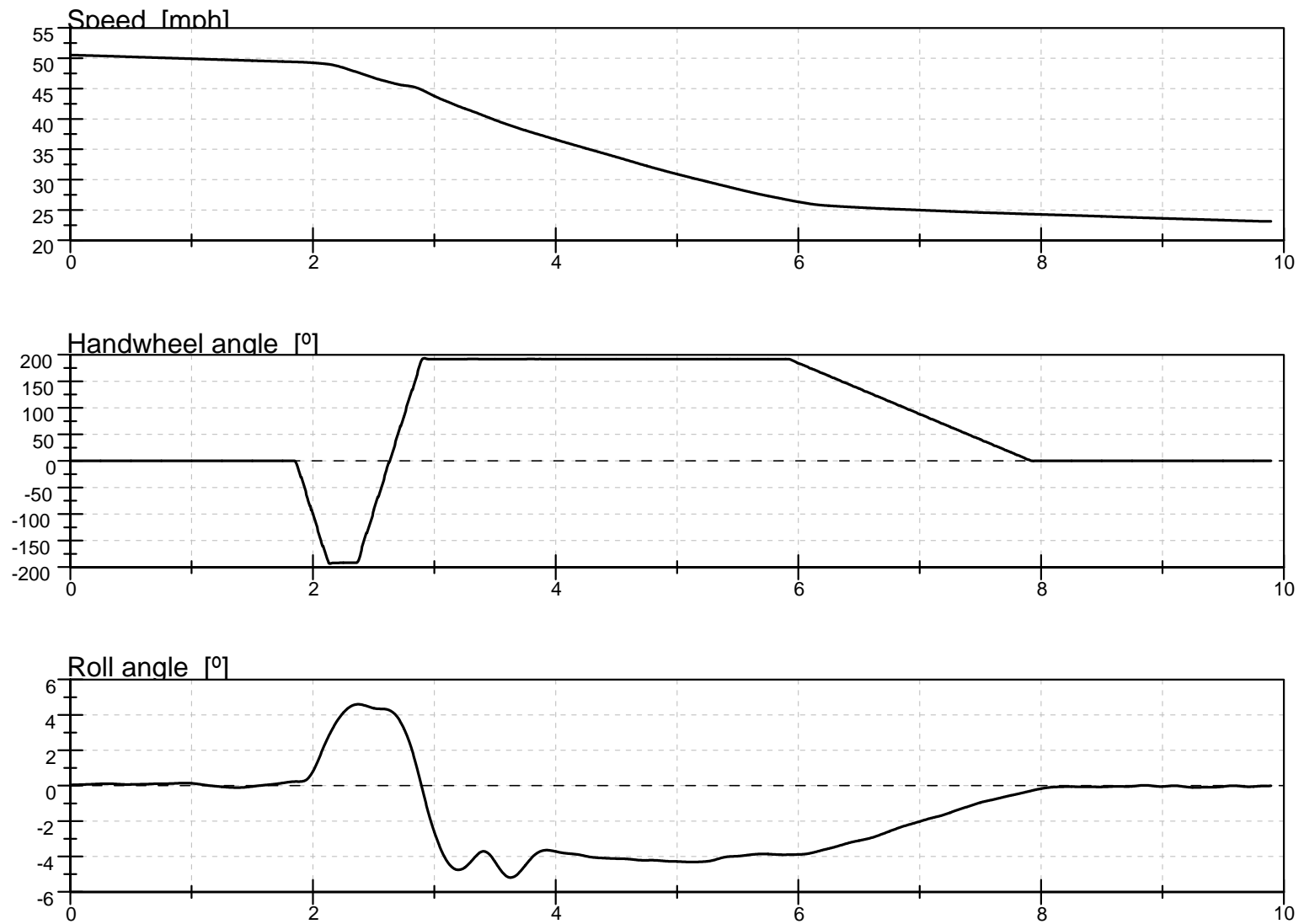


Figure D9. Vehicle Speed, Handwheel Angle, and Roll Angle Time History Plots for Supplemental 2 Test Series, L-R, 50 mph

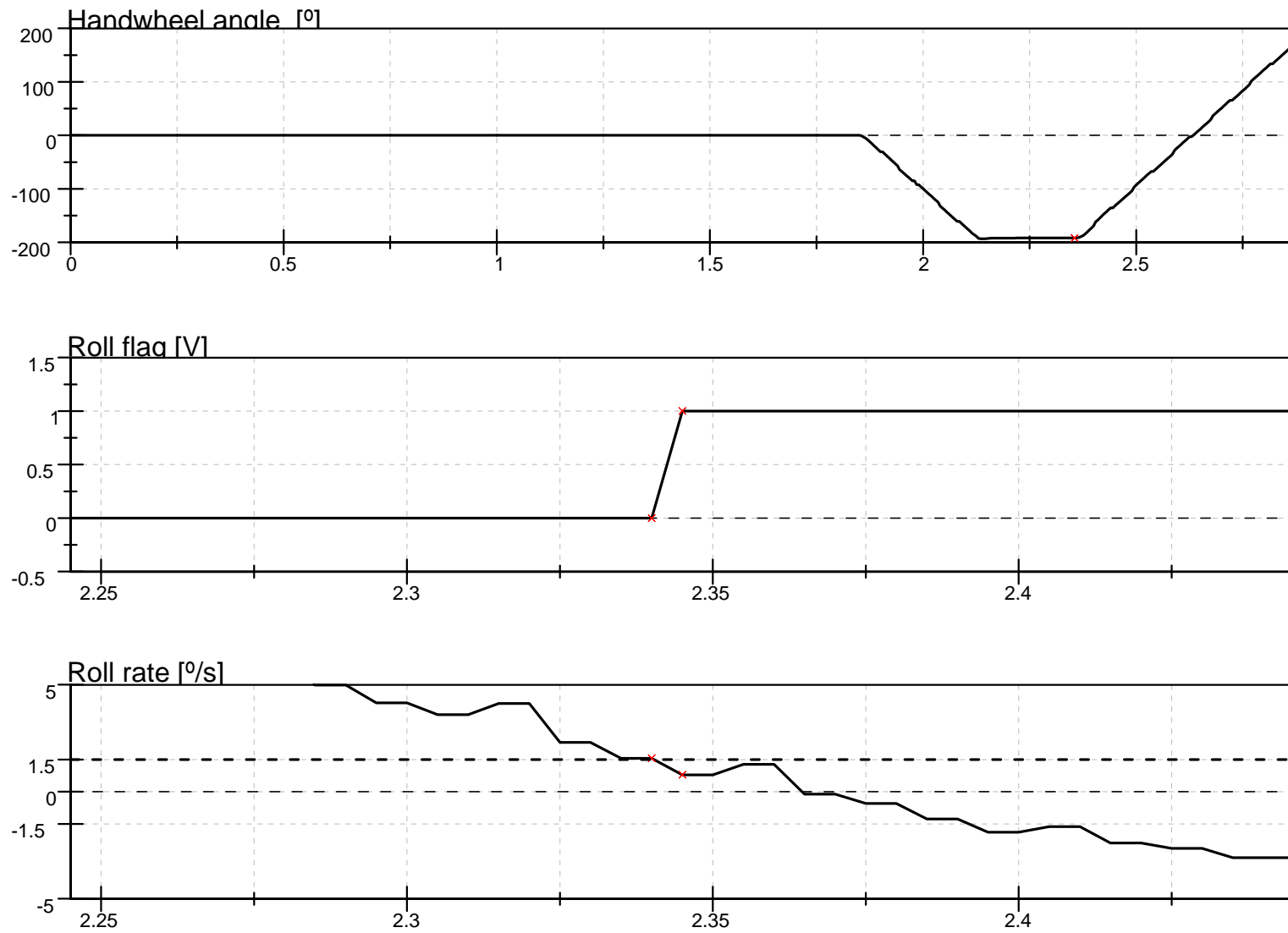


Figure D10. Steering Machine Operation Time History Plots for Supplemental 2 Test Series, L-R, 50 mph

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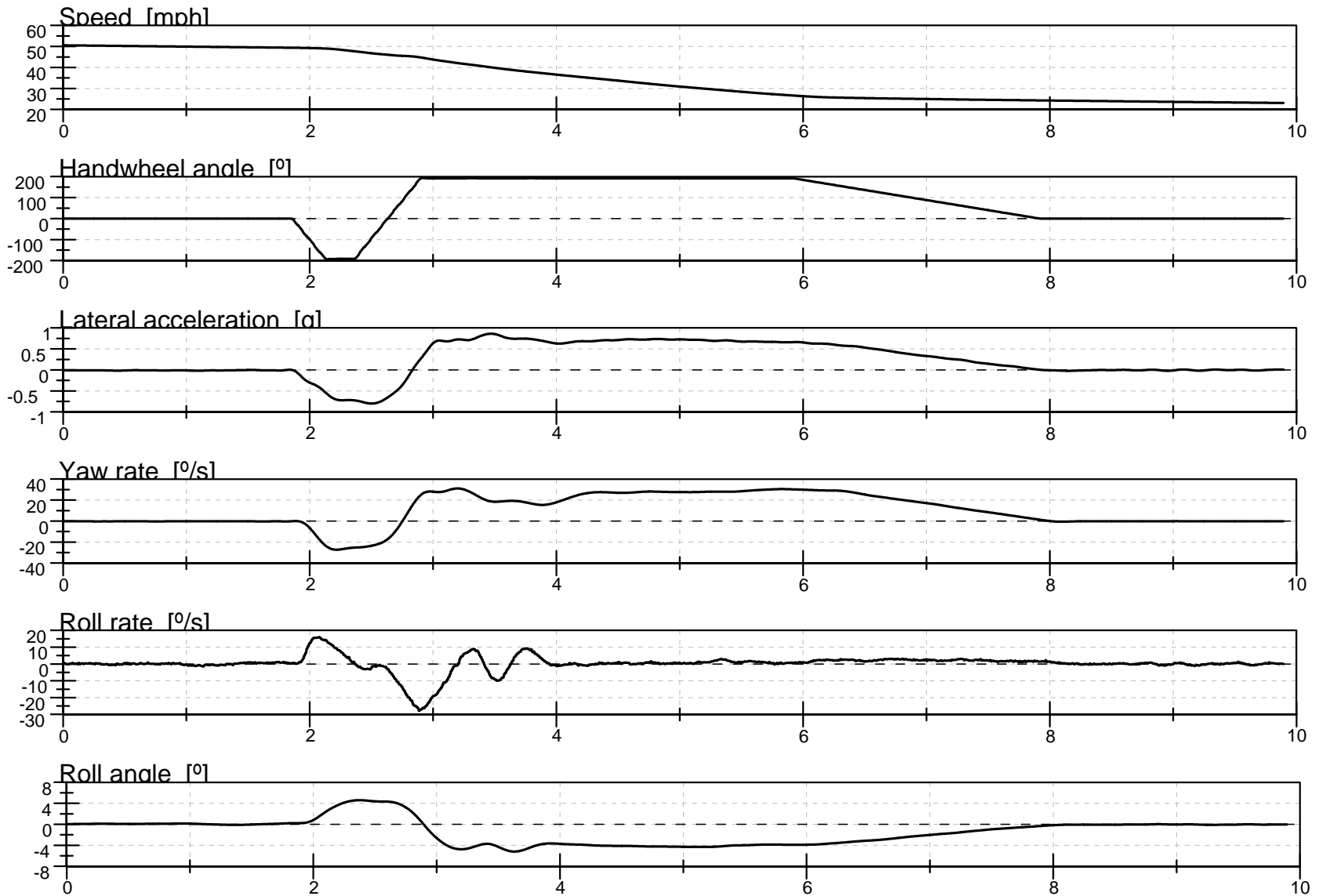


Figure D11. Yaw Rate, Roll Rate, and Lateral Acceleration Time History Plots for Supplemental 2 Test Series, L-R, 50 mph

FILENAME: FH013

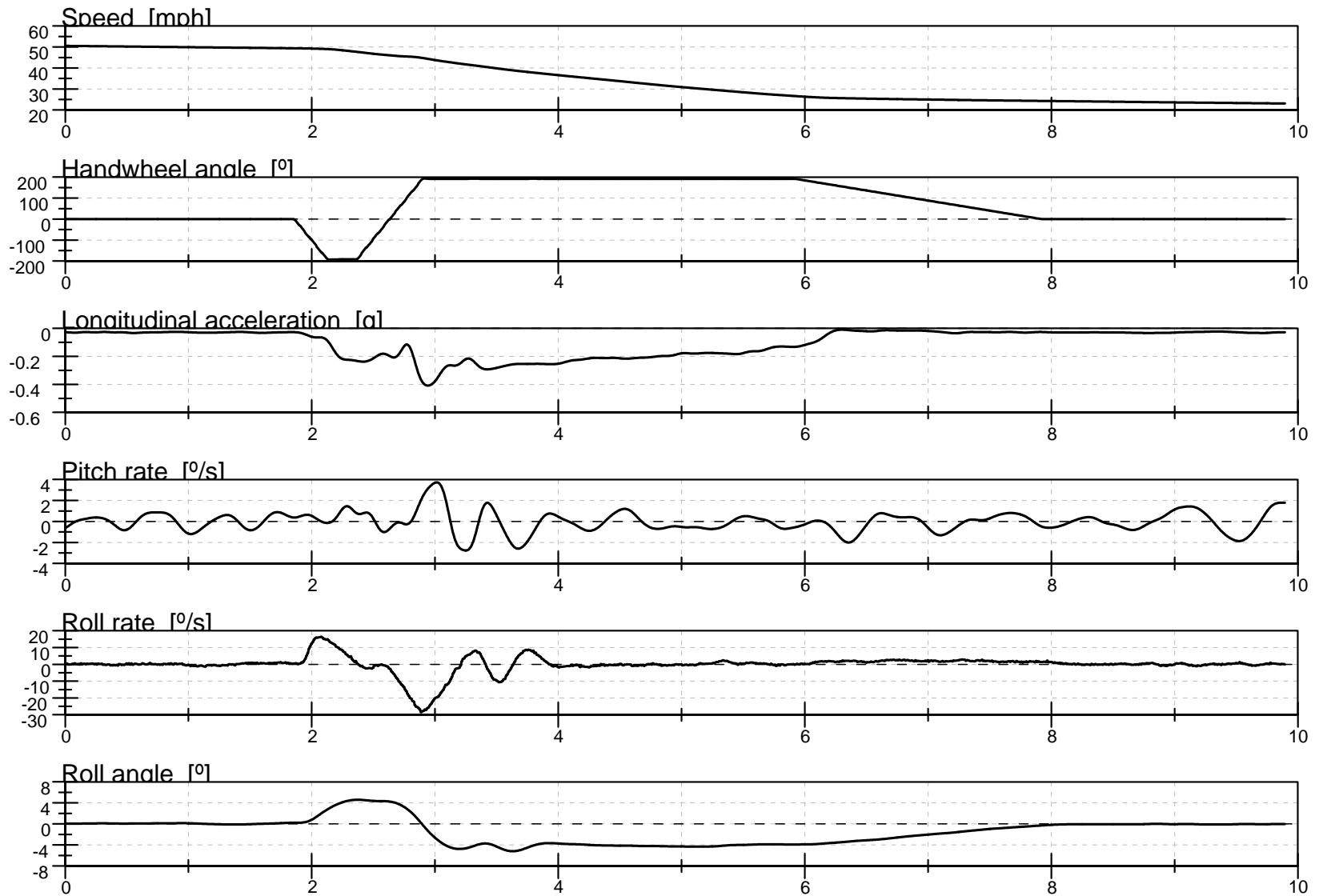


Figure D12. Pitch Rate and Longitudinal Acceleration Time History Plots for Supplemental 2 Test Series, L-R, 50 mph

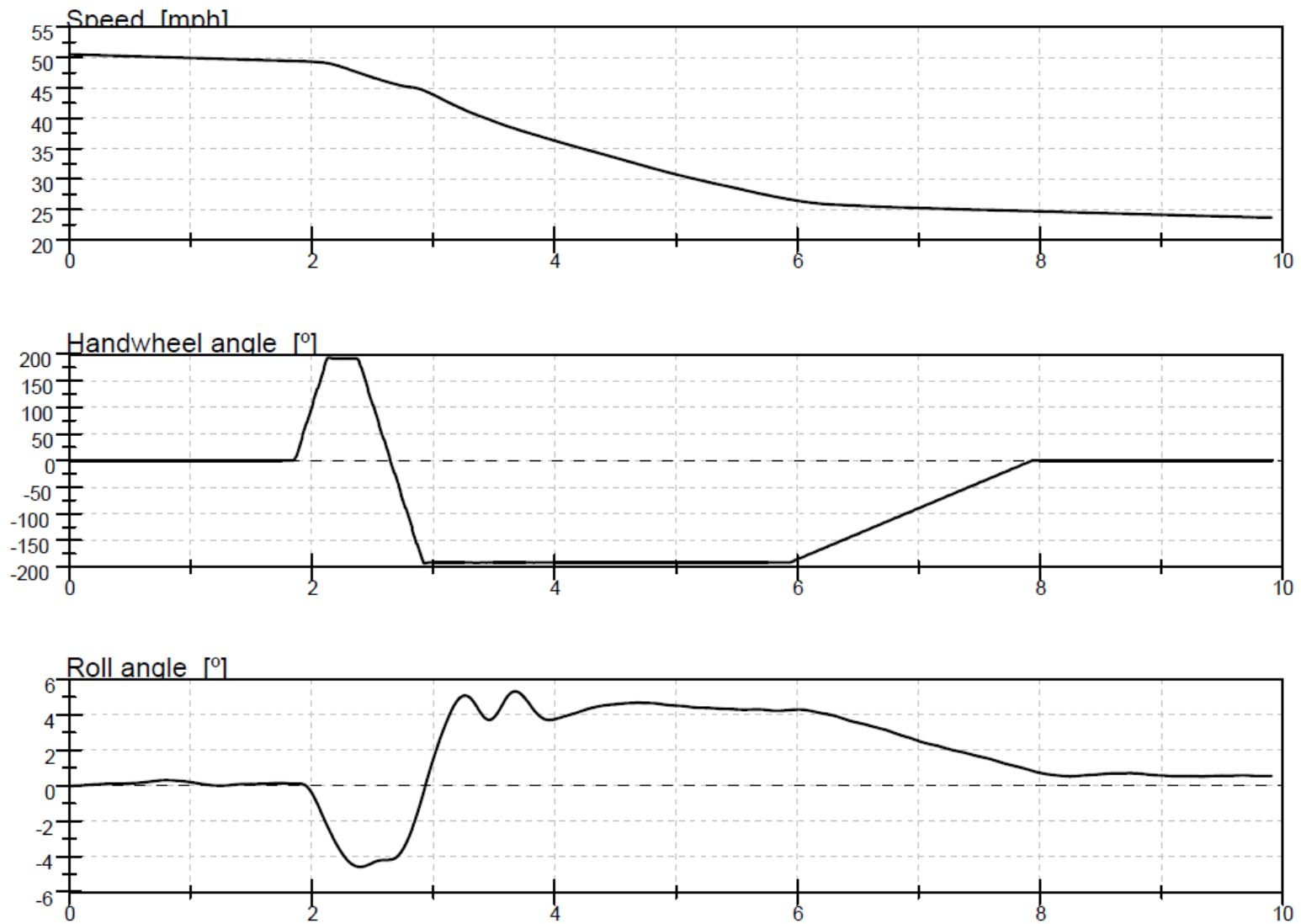


Figure D13. Vehicle Speed, Handwheel Angle, and Roll Angle Time History Plots for Supplemental 2 Test Series, R-L, 50 mph

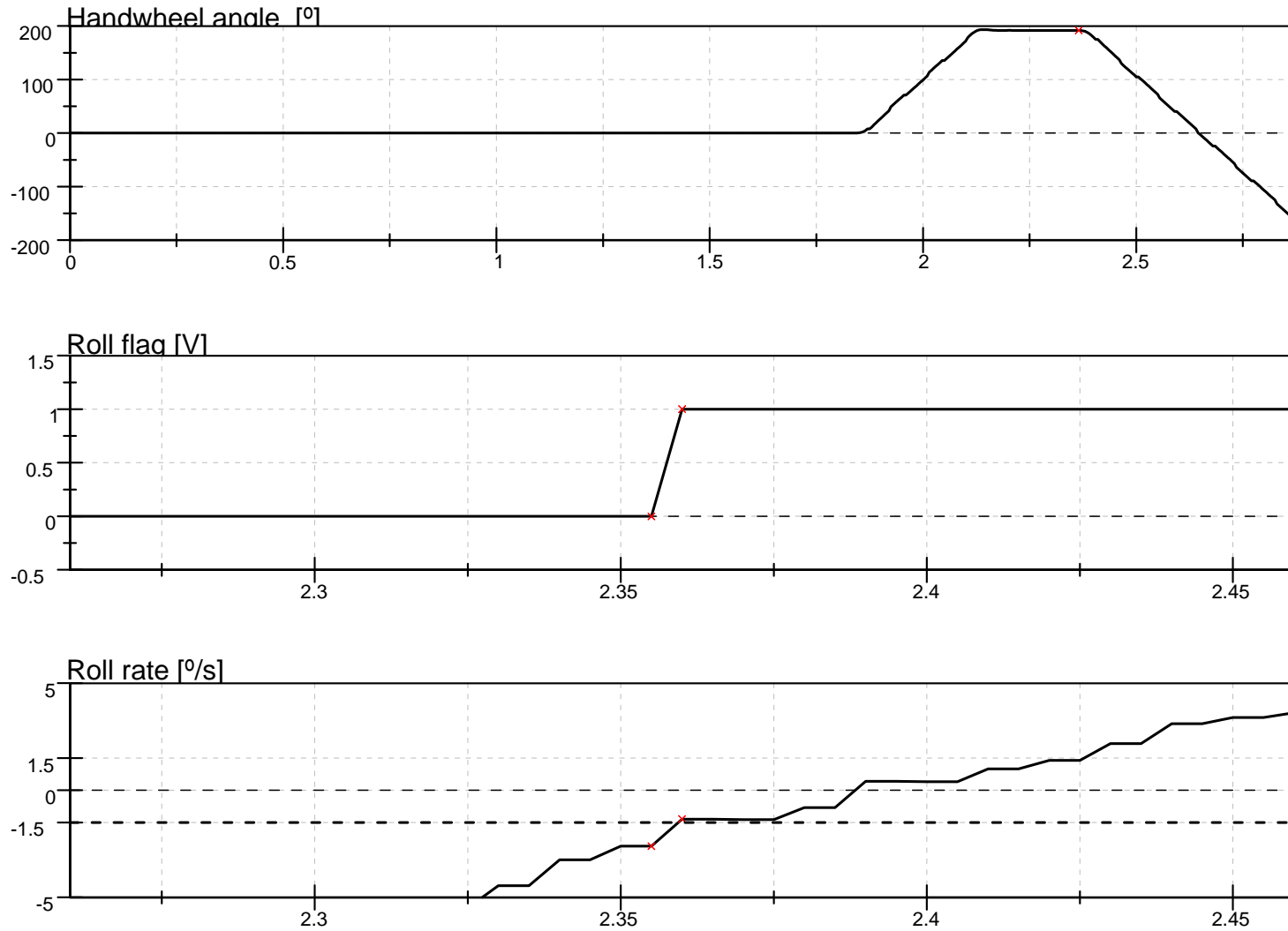


Figure D14. Steering Machine Operation Time History Plots for Supplemental 2 Test Series, R-L, 50 mph

FILENAME: FH016

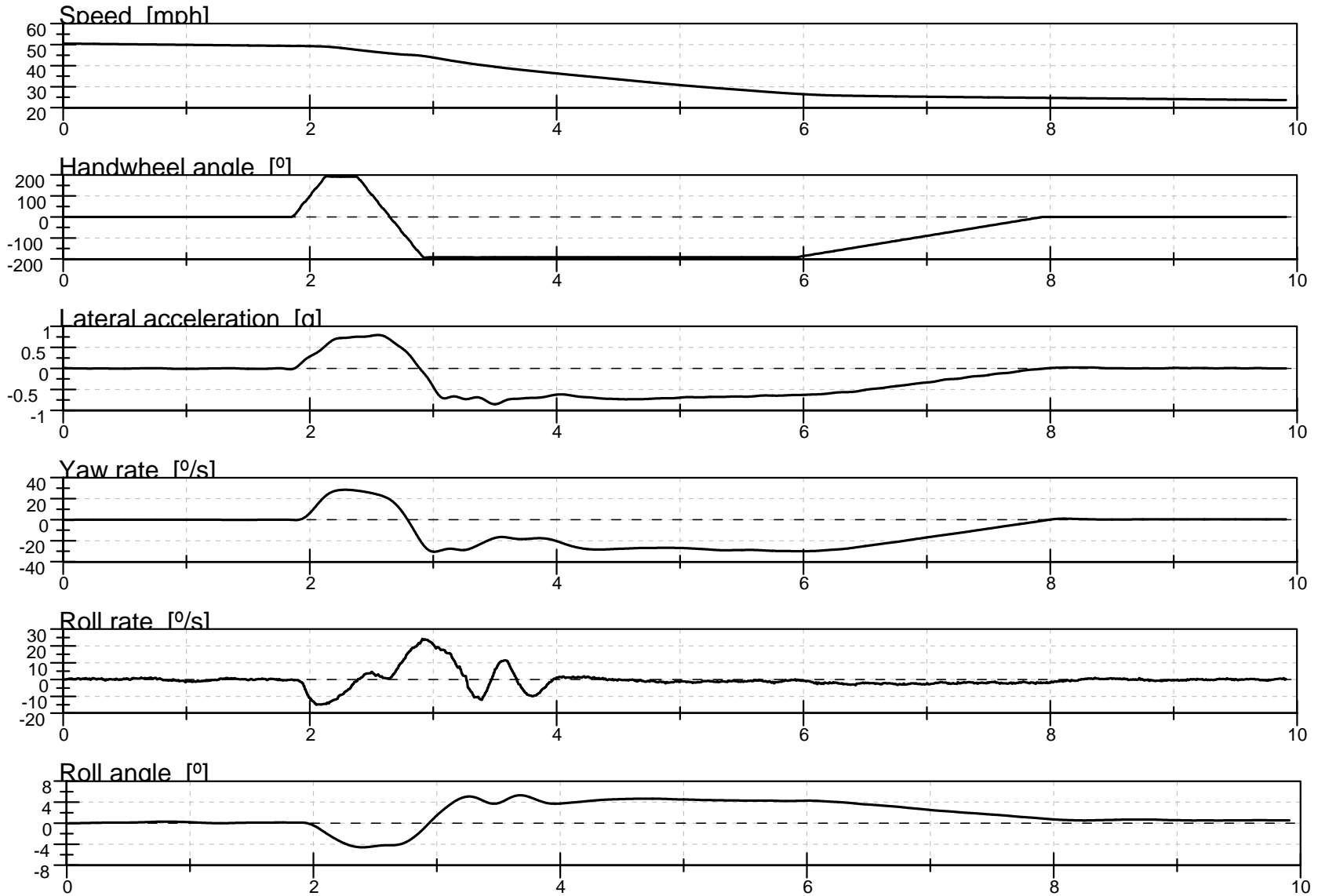


Figure D15. Yaw Rate, Roll Rate, and Lateral Acceleration Time History Plots for Supplemental 2 Test Series, R-L, 50 mph

FILENAME: FH016

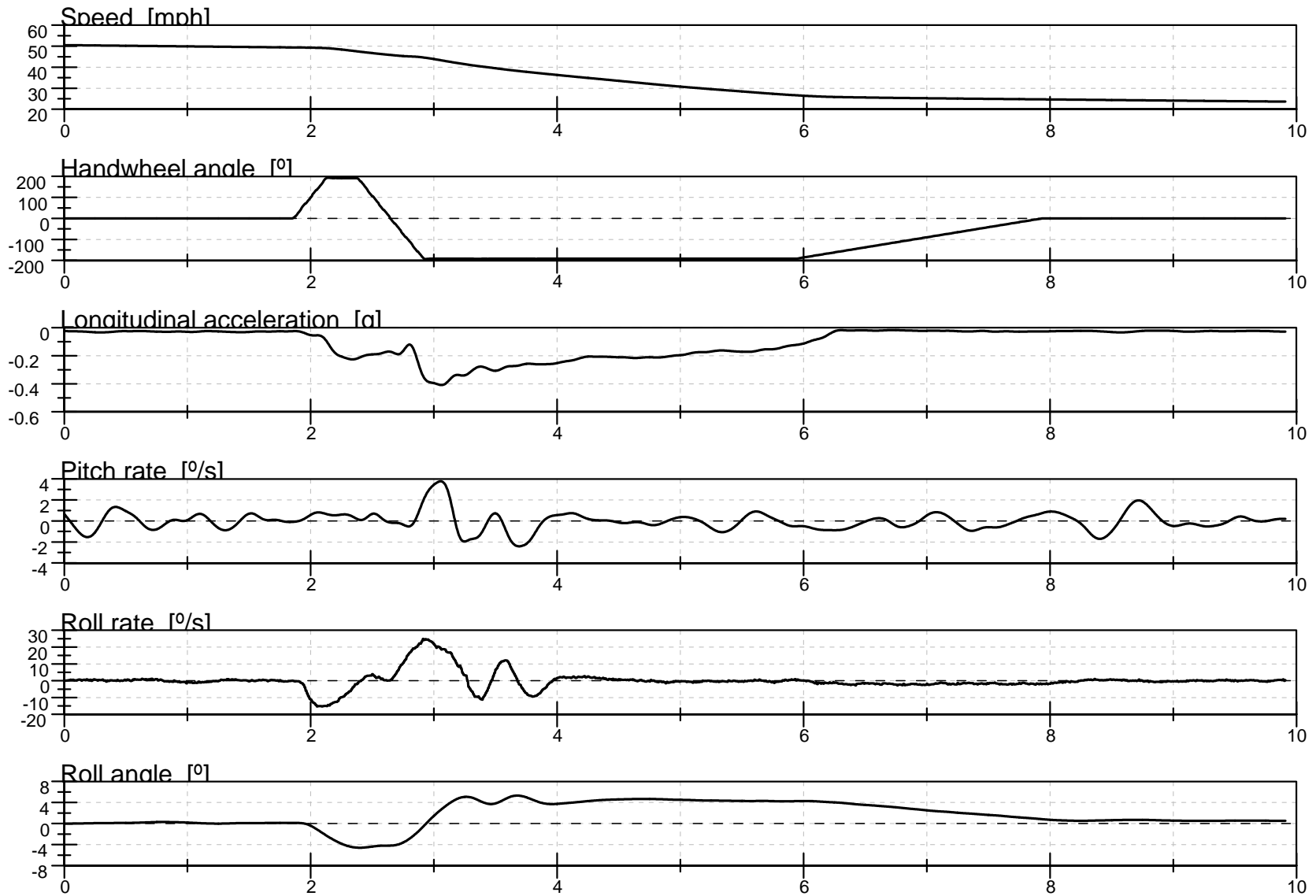


Figure D16. Pitch Rate and Longitudinal Acceleration Time History Plots for Supplemental 2 Test Series, R-L, 50 mph